

WHAT IS CLAIMED IS:

1. An optical disc drive which can record and/or reproduce data onto and/or from an optical disc, the optical disc drive comprising:
  - a spindle motor for rotating the optical disc;
  - rotation number measuring means for measuring the rotation number of the spindle motor;
  - brake means for braking the spindle motor to reduce the rotation number thereof, the brake means including at least three types of brake modes; and
  - selecting means for selecting one of the at least three types of brake modes in response to the rotation number measured by the rotation number measuring means when the rotation number of the spindle motor is to be reduced.
2. The optical disc drive according to claim 1, wherein the spindle motor is a three-phase motor having three coils, and wherein the at least three types of brake modes includes a first brake mode which uses windage loss by idling of the spindle motor, a second brake mode which uses a short brake that is made by causing short circuit in between any two coils of the three coils in the spindle motor, and a third brake mode which uses a reverse rotation brake that is made by controlling the current flow so as to rotate the spindle motor in the reverse direction of the normal rotation.
3. The optical disc drive according to claim 2, wherein the rotational speed range of the spindle motor is divided into at least three ranges including a high range, a medium range and a low range, in which the first brake mode is used in the high range, the second brake mode is used in the medium range and the third brake mode is used in the low range.
4. The optical disc drive according to claim 1, further comprising judging means for judging whether the rotation number of the spindle motor measured by the rotation number measuring means reaches a predetermined target

rotation number when the brake means is applied to the spindle motor,

wherein the application of the brake means is completed when the judging means judges that the rotation number of the spindle motor reaches the predetermined target rotation number.

5. The optical disc drive according to claim 4, wherein the predetermined target rotation number includes a rotation number at which the rotation of the optical disc is considered to be stopped.

6. The optical disc drive according to claim 1, wherein the spindle motor includes a magnet rotor.

7. The optical disc drive according to claim 6, further comprising position detecting means for detecting the position of the magnet rotor in the spindle motor, the position detecting means including a plurality of hall elements disposed on the magnet rotor so as to be spaced at certain intervals.

8. The optical disc drive according to claim 7, wherein the rotation number measuring means measures the rotation number of the spindle motor based on the pulse number outputted from the plurality of hall elements.

9. The optical disc drive according to claim 1, further comprising a driver for driving the spindle motor, the driver including a plurality of switching elements and switching means for switching between on and off of each of the plurality of switching elements wherein the selecting means is operated by switching these switching elements by means of the switching means.

10. The optical disc drive according to claim 9, wherein each of the plurality of switching elements is constituted from an NPN type transistor.

11. A brake control method of an optical disc drive, the optical disc drive being capable of recording and/or reproducing data onto and/or from an optical disc by rotating the optical disc by means of a spindle motor, the method

comprising the steps of:

measuring the rotation number of the spindle motor; and  
controlling the spindle motor based on the measured rotation number so that the rotation number of the spindle motor is reduced by windage loss of idling of the spindle motor when the spindle motor rotates at a predetermined high-speed range.

12. A brake control method of an optical disc drive, the optical disc drive being capable of recording and/or reproducing data onto and/or from an optical disc by rotating the optical disc by means of a spindle motor, the method comprising the steps of:

- a) measuring the rotation number of the spindle motor;
- b) judging whether the measured rotation number of the spindle motor reaches a predetermined target rotation number or not;
- c) judging which rotational speed range the measured rotation number of the spindle motor is among a high-speed range, a medium-speed range and a low-speed range, in the case where the rotation number of the spindle motor does not reach the predetermined target rotation number;
- d) based on the judged speed range, selecting one of at least three types of brake modes;
- e) braking the spindle motor to reduce the rotation number thereof by the selected brake mode; and
- f) repeating the steps a) through e) until the measured rotation number of the spindle motor reaches the predetermined target rotation number.

13. The method according to claim 12, wherein the spindle motor is a three-phase motor having three coils, and wherein the at least three types of brake modes includes a first brake mode which uses windage loss by idling of the spindle motor, a second brake mode which uses a short brake that is made by causing short circuit in between any two coils of the three coils in the spindle motor, and a third brake mode which uses a reverse rotation brake that is made by controlling the current flow so as to rotate the spindle motor in the reverse direction of the normal rotation.

14. The method according to claim 13, wherein in the braking step, the idling brake is used when the measured rotation number of the spindle motor is in the high-speed range, the short brake is used when the measured rotation number is in the medium-speed range, and the reverse rotation brake is used when the measured rotation number is in the low-speed range.